Efficacy of Adapted Cued Speech in Identifying and Differentiating Tamil Speech Sounds in Students with Hearing Impairment

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Introduction

Language plays a crucial role in everyone's life. The ability to communicate clearly and accurately is the prerequisite for success and fulfilment in life. As such the hearing impaired are deprived of such a vital prerequisite because of their handicap. It is imperative to help them overcome this obstacle. Cued speech was first conceived and developed in the English language. Since it was proved to be effective, Cued Speech has been adapted in almost 60 other languages. It is worth mentioning that not only the parent languages but also their varied dialects have been included under this system.

The current endeavour is to analyse the various aspects of the Cued Speech and the effort starts with a thorough knowledge of how normal language behaves, further continuing with how such a behaviour may be extrapolated to the branch of Cued Speech. Additionally, the possibility of Cued Speech for Tamil speaking learners is explored.

Rationale of the Study

Communication skills are the ability to share and receive any kind of information. Effective communication requires two or more people's active engagement with the fluent use of language. Language creates a connection between two or more people during communication. Children learn a language naturally from an early age by interacting with parents, family members, and others around them. Listening is one of the most critical steps in language learning. It is natural for the children to learn to speak by listening to others from an early age, if they cannot hear they have disadvantage in developing certain essential skills in speech and language.

Like their normal peers, the Students with Hearing Impairment (SwHI) need academic growth and all-round development. Individuals with normal hearing sense can distinguish all the phonological contrasts of speech sounds, but SwHI cannot. Thus, various remedies such as the cochlear implant, hearing aids, visual stimulations, sign language, lip reading, facial expressions, and residual hearing senses are used to support academic growth and enhance communication skills in them. However, all these remedies have limitations. For example, lip reading, the common technique advised for the hearing impaired in identifying and differentiating all the phonemes, is only partially effective. In addition, speech reading (including facial expression, body language, and linguistic, situational, and lip-reading cues) is also not effective, since it needs intensive training. The use of digital aids or hearing aids helps to access the sounds, but the signals provided by these aids are also not clear for them. Cochlear implants also have limitations in helping the speech perception abilities of SwHI. Thus, there is an urgent need to incorporate speech and language skills to accelerate oral communication skills among the hearing impaired. It is here that Adapted Cued speech, originally designed by Orin Cornett (1967), comes to the rescue. This Cued Speech has been proven to have overcome all the difficulties mentioned here.

Significance of the Study

- Intervention modules for learning Tamil speech sounds, different mouth shapes while producing the speech sounds, and formation of compound letters can be developed to acquire the prerequisite skills in learning Cued Speech
- Intervention modules for learning Adapted Cued Speech for Tamil language in Students with Hearing Impairment can be developed to address the communication needs of students with hearing impairment
- Learning the Prerequisite Skills and Adapted Cued Speech enhances the skill in speech and language among the Students with Hearing Impairment , which in turn helps them in literacy development and academic achievement
- Efficacy of Adapted Cued Speech for Tamil language in perceiving speech can be assessed through Pre-test, Post-test and Follow-up

Statement of the Problem

The statement of the problem is worded as **"Efficacy of Adapted Cued Speech in Identifying and Differentiating Tamil Speech Sounds in Students with Hearing Impairment".**

Operational Definition

Efficacy

The term "Efficacy" refers to the ability of Cued Speech to enable Students with Hearing Impairment to discriminate Tamil speech sounds.

Adapted Cued Speech

The term "Adapted Cued Speech" refers to a form of communication for the hearing impaired, in which lip-reading is enhanced by hand signals that distinguish between similar lip movements, is modified to perceive Tamil speech sounds.

Tamil Speech Sounds

The term "Tamil Speech Sounds" refers to the phonetically distinct units of speech in the use of Tamil language.

Identifying

The term "Identifying" refers to recognising the Tamil speech sounds and perceiving vowels, consonants, compound letters, and words in communication.

Differentiating

The term "Differentiating" refers to the state of being able to see the difference between two or more Tamil speech sounds.

Students with Hearing Impairment

The term "Students with Hearing Impairment" refers to individuals with severe/profound hearing loss studying in special/inclusive school belonging in the age group of 5 – 20 year olds.

Objectives of the Study

- Assess the prerequisite skills required to learn Adapted Cued Speech for the Students with Hearing Impairment.
- Develop an intervention package and study its impact in the acquisition of the prerequisite skills for learning Cued Speech
- Adapt Cued Speech for Tamil speech sounds
- Develop an intervention package on Adapted Cued Speech to enhance the ability to identify and differentiate Tamil speech sounds.
- Assess the efficacy of using Adapted Cued Speech to identify and differentiate Tamil speech sounds.
- Analyze the ability of Students with Hearing Impairment to identify and differentiate Tamil speech sounds before and after intervention with respect to variables.

Hypotheses

- There is no significant difference between Pre and Post test scores on the Prerequisite Skills: 1)Awareness on Tamil Speech Sounds, 2) Skills to Identify the Mouth Shapes and 3) Skills to Form Compound Letters among Students with Hearing Impairment.
- There is no significant difference between Pre test, Post test, and Follow-up scores on Skills to identify and differentiate Vowels, Consonants, Compound Letters and Words among Students with Hearing Impairment.
- There is no significant difference between Pre test, Post test, and Follow-up scores on Skills to identify and differentiate Tamil Speech Sounds with respect to Age, Gender, Locality, Mother Tongue Type of School, and Degree of Hearing Loss among Students with Hearing Impairment.

Scope of the Study

- ❖ The purpose of the study was to analyze the impact of Adapted Cued Speech in developing the skills to identify Tamil Speech sounds among Students with Hearing Impairment , and the study was experimental in nature
- ❖ The findings of the study will enable parents, caregivers, therapists, family members, and teachers to understand the need for Cued Speech in developing speech and language in Students with Hearing Impairment
- ❖ The findings enable us to realize that one can understand communication effectively in various environments with the help of Cued Speech, even though one cannot hear wholly or partially..

Review of Literature

Lisan, Sloten, and CédricLemogne (2019) conducted a study on *"Association of Hearing Impairment with Incident Depressive Symptoms: A Community-Based Prospective Study."* Using a prospective community-based cohort study in France (the Paris Prospective Study III), participants aged 50-75 years were recruited between 2008 and 2012 and, after that, followed up every 2 years up to 2018. Incident depressive symptoms, measured using the validated 13-item Questionnaire of Depression 2nd version, were assessed during follow-up. Multivariate generalized estimating equations were used to compute the Odds Ratio (OR) and 95 percent confidence intervals (CI). Among 7591 participants free of depressive symptoms at baseline (mean age 59.8 years, 63% of men), 14.3 percent had a hearing impairment. Over 6 years of follow-up, 479 subjects (6.3%) had incident depressive symptoms. The OR for incident depressive symptoms was 1.36 for subjects with baseline hearing impairment (95% CI, 1.06-1.73).

"*Noise and a Speaker's Impaired Voice Quality Disrupt Spoken Language Processing in School-Aged Children: Evidence from Performance and Response Time Measures*." was studied by Schiller, Morsomme, Kob, and Remacle (2020). They investigated the isolated and combined effects of Speech-Shaped Noise (SSN) and a speaker's impaired voice quality on spoken language processing in first-grade children. In individual examinations, 53 typically developing children aged 5–6 years performed a speech perception task (phoneme discrimination) and a listening comprehension task (sentence-picture matching). Speech stimuli were randomly presented in a 2 × 2 factorial design with *noise* (no added noise vs. SSN at 0- dB SNR) and *voice quality* (standard versus impaired voice). Outcome measures were task performance and Response Time (RT). SSN and impaired voice quality significantly

lowered children's performance and increased RTs in the speech perception task, particularly when combined.

Torres and Moreno-Torres (2020) studied *"Quantitative and Qualitative Evaluation of Linguistic Input Support to a Prelingually Deaf Child With Cued Speech: A Case Study."* The study evaluated the linguistic input received by a deaf child exposed to Cued Speech (CS) in the final part of her prelinguistic period (18–24 months). The subjects were the child, her mother, and her therapist. Analysis of data provided about the quantity of input directed to the child (oral input, more than 1,000 words per half-an-hour session; cued ratio, more than 60% of oral input; and attended ratio, more than 55% of oral input), its linguistic quality (lexical variety, grammatical complexity, etc.), and other properties of interaction (child attention and use of spontaneous gestures). In addition, results show that both adults provided a rich linguistic input to the child and that the child attended most of the input that the adults cued. These results explain the positive linguistic development of children exposed early to Cued Speech.

Krause, Kegl, and Schick (2020) investigated a study *"Toward Extending the Educational Interpreter Performance Assessment to Cued Speech."* The Educational Interpreter Performance Assessment (EIPA) is an essential research tool for examining the quality of interpreters who use American Sign Language or a sign system in classroom settings. Still, it does not currently apply to educational interpreters using Cued Speech (CS). To determine the feasibility of extending the EIPA to include CS, a pilot EIPA test was developed and administered to 24 educational CS interpreters. Results show that the instrument had good construct validity, test-retest reliability and interrater reliability was relatively high (0.9), Notably, only 48 percent of interpreters who formally participated in pilot testing performed at a level that could be considered minimally acceptable. In light of similar performance levels previously reported for interpreters who sign (e.g., Schick, Williams, & Kupermintz, 2006), these results suggest that interpreting services for deaf and hard-of-hearing students, regardless of the communication option used, are often inadequate and could seriously hinder access to the classroom environment.

"*Can Explicit Training in Cued Speech Improve Phoneme Identification?*" was studied by Rees, Fitzpatrick, Foulkes, Peterson, and Newton (2017) Sixty-two adult hearing participants were allocated to a single training session in one of three training conditions: Cued Speech Training (CST), Lipreading Training, and Auditory Training in Noise. They were all tested on their ability to identify 13 phonemes in non-words when denied access to sound. The

CST group made highly significant improvements in identifying cued phonemes, and these changes could not be explained by lipreading practice or familiarization with a closed set of phonemes.

Aparicio, Peigneux, Charlier, Neyrat, and Leybaert (2012) studied "*Early Experience of Cued Speech Enhances Speechreading Performance in Deaf*." In this study, speechreading performance was assessed in Normal Hearing participants (NH), deaf participants who had been exposed to the Cued Speech (CS) system early and intensively, and deaf participants exposed to oral language without Cued Speech (NCS). Results showed a gradation in performance with the highest performance in CS, then in NCS, and finally NH participants. Moreover, error analysis suggested that speechreading processing was more accurate in the CS group than in the other groups. Given that early and intensive CS has been shown to promote the development of accurate phonological processing. The authors proposed that the higher speechreading resulted in Cued Speech users being linked to a better capacity in phonological decoding of visual articulators.

Research Gap

- Most of the researches focus on the problems faced by the Students with Hearing Impairment and specific to speech and language development
- There are many researches on assessment, teaching-learning speech and language, benefits of various techniques and strategies, and benefits of amplification devices
- In spite of numerous researches done related to hearing impairment, studies pertaining to Cued Speech are limited
- No research is done on the efficacy of Cued Speech for Tamil language and also on the prerequisite skills required to learn Cued Speech

Methodology

The methodology for the study involved Quasi-experimental design with pre and post-test single-group design. Forty-five participants aged between 5 to 20 years were selected for the study by following stratified sampling technique. They were grouped age-wise as: i) 5-10 years, ii) 11-15 years, and iii) 16-20 years. The participants were Students with Hearing Impairment with Severe Hearing Loss or Profound Hearing Loss. Development of tools and intervention packages for use in the present study involved:

Phase 1 Prerequisite Skills for learning Cued Speech and

Phase 2 Adapted Cued Speech in identifying and differentiating Tamil speech sounds.

Variables of the Study

Independent Variable	Age group, Gender, Locality, Mother Tongue, Type of School, Degree of hearing loss
Dependent Variable	Prerequisite Skills for learning Adapted Cued Speech namely: • Awareness on Tamil speech sounds • Identification of Mouth Shape • Formation of Compound Letters Efficacy of Adapted Cued Speech Intervention Package in identifying and differentiating Tamil speech sounds in the following aspects: • Vowels • Consonants • Compound Letters • Words

Tools for the Study

1. Personal data schedule
2. Tool to assess the prerequisite skills for learning Cued Speech
   Part A - Awareness on Tamil speech sounds – 30 items
   Part B - Skill to Identify the Mouth Shapes – 10 items
   Part C- Skill to form Compound Letters – 10 items
   (Scoring: Correct response - 1; Incorrect response – 0)
3. Tool to assess the efficacy of Cued Speech in identifying and differentiating Tamil speech sounds
   Part A - Vowels – 5 items
   Part B - Consonants – 10 items
   Part C - Compound Letters – 5 items
   Part D - Words – 5 items
   (Scoring: Correct response - Part A & B – 1; Part C – 2; Part D – 3 & Incorrect response – 0)

Intervention Packages

(i) Intervention package for training on prerequisite skills to learn Cued Speech

Fifteen training modules and two drills per module were prepared and used for intervention. The training modules included the following aspects:

- **Awareness on Tamil Speech Sounds -** Powerpoint presentations, Videos & YouTube videos on speech sounds production are used for intervention. The content

included: 1) Introduction on speech sounds in Tamil language; 2) Vowel sounds; 3) Hard consonants; 4) Soft consonants; 5) Middle consonants; 6) Grantha consonants

- **Skill to identify the Mouth Shape –** Picture cards showing different mouth shapes while producing Tamil speech sounds and set of sounds belonging to each mouth shape were prepared and used for intervention
- **Skill to form Compound Letters -** A self-learning material is prepared to learn how compound letters are formed was prepared and used for intervention

(ii) Intervention package for training on Adapted Cued Speech

Introductory video on Cued Speech, 30 training modules and 2 drills per module were prepared and used for intervention. The intervention included the following aspects:

- Basics of Cued Speech – 8 Handshapes, 4 Positions around mouth (mouth, chin, throat & side) & 2 Movements (side to throat & 1" forward)
- Adapted Cued Speech for Consonant sounds in Tamil – Handshapes 1-8 & 1 Position (side)
- Handshapes for Hard Consonants – *க், ச், ட், த், ப், ற்*
- Differentiating 3 'n's (*ந், ன், ண்*) and 3 'l's (*ல், ள், ழ்*) using Handshapes
- Adapted Cued Speech for Vowel sounds in Tamil – Handshape 5 & 3 Positions (mouth, chin, & throat)
- Adapted Cued Speech for Compound letters in Tamil – combinations of Handshapes of Consonant sounds and Positions of Vowel sounds
- Adapted Cued Speech for Compound letters in Tamil – 2-4 letter words

Period of Intervention

The intervention sessions were planned and implemented as follows:

The intervention sessions included training sessions and practice sessions. The intervention on Prerequisite Skills for learning Cued Speech had 15 training sessions and 30 practice sessions. The intervention on Adapted Cued Speech in identifying and differentiating Tamil speech sounds had 30 training sessions and 60 practice sessions. The participants were divided into three groups based on their age group: Group 1(G1) – 5-10 years; Group 2(G2) – 11-15 years; Group 3(G3) – 16-20 years. The intervention was carried out as per the following schedule:

Groups					
G1		**G2**		**G3**	
Training	**Practice**	**Training**	**Practice**	**Training**	**Practice**
Mon	Tue, Wed	**Tue**	Wed, Thurs	**Wed**	Thurs, Fri
Thurs	Fri, Sat	**Fri**	Sat, Mon	**Mon**	Tue, Wed
Tue	Wed, Thurs	**Wed**	Thurs, Fri	**Thur**	Fri, Sat
Fri	Sat, Mon	**Mon**	Tue, Wed	**Tue**	Wed, Thurs
Wed	Thurs, Fri	**Thurs**	Fri, Sat	**Fri**	Sat, Mon

Each training session was followed by 2 practice sessions.

Collection of Data

The collection of data consisted of the following: 1) Collecting Personal Information; 2) Pretest - Prerequisite Skills to learn Cued Speech and Ability to identify and differentiate Tamil speech sounds; 3) Intervention on Prerequisite Skills to learn Cued Speech and Post Test to assess the prerequisite skills; 4) Intervention on Adapted Cued Speech and Post Test to assess the ability to identify and differentiate Tamil Speech sounds; 5) Follow-up

Data Analysis Techniques

The following statistical techniques are used by the investigator for analysing the Prerequisite Skills to learn Cued Speech and the efficacy of Adapted Cued Speech in identifying and differentiating Tamil Speech Sounds in Students with Hearing Impairment:

1. Mean & Standard Deviation
2. One-way ANOVA
3. Repeated Measures of ANOVA
4. Bonferroni's Pair wise comparison
5. Tukey's HSD Post Hoc. Test

Findings

The major findings of the study are briefly summarised under the following heads:

A. Efficacy of Intervention Package on Prerequisite Skills to learn Cued Speech

1) Awareness of Tamil Speech Sounds

The training was provided to Students with Hearing Impairment to increase their awareness of the Tamil speech sounds. While comparing the pre (M=13.11) and the post-test (M=20.22) mean scores, it was found that the training on prerequisite skills was influential in developing the awareness of the speech sounds in the Tamil language, which is essential for communication.

2) Skills to Identify the Mouth Shapes

Following the mouth shapes during conversations is essential for a better understanding. Identical mouthshapes for speech sounds were grouped and the learners were trained in these groups .The pre-test and post-test scores indicated that Students with Hearing Impairment could discriminate the speech sounds following the mouthshapes

3) Skills to Form Compound Letters

Compound letters are the combination of vowels and consonants. Training was provided through self-learning material to learn how the compound letters are formed. While comparing the pre-test and post-test results, it was evident that the training enabled the individuals to decipher the science behind the formation of compound letters.

B) Efficacy of Intervention Package on Adapted Cued Speech in identifying and differentiating Tamil speech sounds

1) Vowel

i. Learning the vowel-sounds is fundamental for language acquisition. So a training was provided to Students with Hearing Impairment through Adapted Cued Speech to enhance their skill to identify and differentiate vowels. The participants were able to identify and differentiate vowels in the pre-test phase, however training through Cued Speech enhanced their skills to identify and differentiate the vowels with proficiency. There was a significant sustainability found out in the performance of identification and differentiation of the vowels in the follow-up phase.

ii. The participants were divided into three age groups (i.e., 5-10 years, 11-15 years, and 16-20 years) and provided training through Cued Speech to identify and differentiate the vowel sounds. The scores for pre-test, post-test, and follow-up phases showed that they were able to improve the skill to identify and pronounce the vowels easily.

iii. The post hoc. test scores indicated that individuals with 16-20 years performed better than the individuals with 5-10 years followed by 11-15 years. The elderly individuals performed better because of their familiarity with the vowels.

iv. Both the boys and girls with hearing impairment showed significant improvement to identify the vowels in the post-test phase, at the same time, the effect of the training was seen later in the follow-up phase also.

v. The pre-test, post-test, and follow-up scores of training through Adapted Cued Speech in Identification and Differentiation of vowels indicated that the locality of the individuals does not influence to learn the skill. Individuals belonged to rural and urban areas able to perform the skill to identify and differentiate vowels in a similar manner.

vi. The participants with Tamil and other languages as Mother Tongue were identified. The results of the pre-test revealed that the individuals' performance level concerning the mother tongue is highly significant to identify vowels. However, results of the post-test and follow up phases showed no significant difference between the two groups to identify the vowels.

vii. The participants were identified from two types of schools they were enrolled viz., Inclusive and Special school. The pre-test, post-test, and follow-up scores of training through Cued Speech in identification and differentiation of vowels indicated that Students with Hearing Impairment improved and a prolonged effect was observed irrespective of the type of school.

viii. The pre-test, post-test, and follow-up scores indicated that the degree of hearing loss did not impact in learning vowel sounds among students with hearing impairment.

2) Consonants

i. Training through Adapted Cued Speech was provided to the participants to identify the consonants in the Tamil language. The mean scores for the pre-test showed that they struggled to identify consonants. However, the post-test and follow-up scores reveal that the intervention helped them to identify the consonants.

ii. The participants of different age group found it difficult to discriminate the consonant sounds in the pre-test phase. However, intervention helped them identify and differentiate the sounds and so they could use it while communicating.

iii. The post hoc. test scores indicated a significant improvement between the groups aged 5-10 years and 11-15 years. Nevertheless, individuals aged 11-15 and 16-20 years were at the same level to identify and differentiate the consonants.

iv. The post-test and follow-up scores of boys and girls indicated that both groups could develop the skill in the identification and differentiation of consonant sounds equally.

v. The locality does not significantly impact learning how to identify and differentiate the consonants.. The follow-up scores of the individuals from the rural and urban localities showed that intervention on Adapted Cued Speech helped retain the skills for a long time.

vi. The results of pre-test, post-test and follow up revealed that the individuals' performance level concerning the mother tongue is highly significant to identify consonants. It indicated that the mother tongue significantly influence identifying the consonants

vii. Students from the inclusive and the special schools showed no significant difference in performing the skills to identify and differentiate the consonants after training. The scores of the follow-up phase also proved that intervention on Adapted Cued Speech enabled the pupils to learn the skills to identify the consonants.

viii. The pre-test scores showed that participants with severe and profound hearing loss struggled to identify and differentiate the consonants. However, intervention on Adapted Cued Speech was helpful for them, irrespective of their degree of hearing loss, to identify and differentiate the consonant as indicated in the post-test and follow-up scores.

3) Compound Letters

i. Compound letters are the combination of consonants and vowels in Tamil. Intervention was provided to Students with Hearing Impairment through Adapted Cued Speech in identifying and differentiating the compound letters, and they experienced difficulties identifying them before the intervention. However, the post-test scores showed that the intervention helped them improve their skills.

ii. While comparing the pre-test and post-test scores among the three age groups, it was evident that the intervention had enhanced the skills to identify and differentiate compound letters. The scores of follow-up phases showed that the they could retain the knowledge for a prolonged period..

iii. A Post hoc. test was performed to analyze the level of performance among the three age groups to identify and differentiate the compound letters. It was found that there was a significant difference between individuals who belonged to 5-10 years and those who belonged to 11-15 years in developing the skills. At the same time, no significant difference was found between the two groups belonged to 11-15 years and 16-20 years.

iv. The results revealed that gender does not play a role in the enhancement of the skill to identify and differentiate compound letters.

v. The pre-test, post-test, and follow-up scores indicated that intervention on Adapted Cued Speech was effective in identifying the compound letters irrespective of whether the participants were from rural or urban.

vi. The results revealed that the mother tongue play a major role in identification and differentiating the compound letters.

vii. From the results of the performance of the participants with respect to the type of school, it was found that they gained a similar level of competencies to identify and differentiate the compound letters.

viii. The performance of the participants was analyzed with respect to the degree of hearing loss. The pre and post-test results showed that both groups benefited equally in identifying and differentiating the compound letters.

4) Words

i. Words are formed by the meaningful arrangement of letters in a language; they are the basic units of expression. It is imperative for the hearing impaired to comprehend words in conversations. Adapted Cued Speech was employed to Students with Hearing Impairment to improve their skills to identify and differentiate words. The level of performance was analyzed in the pre-test, post-test, and follow-up phases. In the pre-test phase, it was found that the participants struggled to identify and differentiate the words. The results of the post-test phase revealed that the intervention increased their ability in identifying words.

ii. The comparison between the pre-test and post-test scores among the three age groups revealed that the intervention had enhanced the skills to identify and differentiate words. The follow-up scores also indicated that the intervention impacted them for long-term.

iii. The post hoc. test was performed to analyze the difference among the three age groups in identifying and differentiating words. It was found that there was a significant difference between the groups 5-10 years and 11-15 years and in contrast, no significant difference was found between the groups 11-15 years and 16-20 years.

iv. The pre-test, post-test, and follow-up scores of boys and girls with hearing impairment revealed that the intervention improved the skill effectively to identify and differentiate words.

v. The participants in rural and urban areas performed at equal levels while identifying and differentiating the words after the training. It meant that rural as well as urban Students with Hearing Impairment benefited from the training and revealed similar performance levels.

vi. The results of the individuals' performance level in pre-test, post-test, and follow-up phases revealed that the mother tongue influence the skill to identify and differentiate the words in Tamil.

vii. The participants from inclusive and special schools were provided training through Cued Speech, and their level of performance was measured in the pre-test, post-test, and follow-up phases. The results indicated that Students with Hearing Impairment

could develop the skills to identify and differentiate words easily, irrespective of the type of school they belonged to.

viii. The participants with severe and profound hearing loss showed a significant improvement in the skill to identify and differentiate words. It was evident from the scores of the pre-test, post-test, and follow-up phases. Thus, the intervention was useful for students with severe and profound hearing loss to increase the skill of identifying words.

C) Correlation

The correlation coefficient for the post test scores of the Prerequisite skills namely, Awareness on Tamil Speech, Skill to Identify Mouth Shape and Skill to form Compound Letter, and the ability to identify and differentiate Vowels, Consonants, Compound letters and Words using Adapted Cued Speech was found using Pearson's Product Moment Correlation method. The results indicated that there is a highly significant correlation among the prerequisite skills and the ability to identify and differentiate Tamil Speech sounds.

Recommendations

- State and Central Govt. should take initiatives to include the communication skills using Cued Speech among general classroom teachers and special educators to handle children with special needs in an Inclusive environment.
- Awareness programs on the benefits of Cued Speech among Special Educators, General Teachers, and Parents of Hearing Impaired should be initiated.
- Teachers should be trained in teaching strategies and techniques to educate individuals with hearing impairment. Training them on Adapted Cued Speech may be an effective strategy to broaden the learners' vocabulary for effective communication.
- Students with hearing impairment need a solution to tackle language and communication problems. Promotion of Cued Speech is a recommended solution.
- Technology-based instructional material should be created to train teachers, parents, and children with hearing impairment on Cued Speech.

Suggestions for further research

- Research studies may be carried out on Cued Speech's effectiveness in identifying speech sounds in the mother tongue among children with hearing impairment.
- Studies can be done on the efficacy of adapted Cued Speech in other Indian languages.
- A comparative study on the effect of Cued Speech and other communication modes in language and communication development among Students with Hearing Impairment may be done.
- A longitudinal study on the efficacy of adapted Cued Speech in the academic achievement of Students with Hearing Impairment can be conducted.
- Further research may be carried out on the attitude and aptitude of teachers and parents in learning and applying Cued Speech in their communication with individuals with hearing impairment.

Conclusion

Language learning is a complex process which comprises mastery of various components. The foundation of all is phonemic awareness which is lacking in students with hearing impairment. Due to this, further processing in speech and language development gets obstructed. Language and cognition are two sides of a coin. If the former develops, the latter also develops simultaneously and is reflected in the academic achievement of individuals. If one can identify and differentiate the speech sounds in a language despite hearing loss, one can overcome all the hurdles further.

The current study explores the possibilities of using Cued Speech to develop communication in Tamil in students with hearing impairment. Subsequently, the same methods may be exploited in other languages. The intervention included training modules on Cued Speech for Vowel sounds, Consonant sounds, Compound letters, and Words. Cued Speech enables an individual to identify speech sounds accurately without any ambiguity. It empowers them to converse in any situation and environment. In addition, irrespective of the degree of their hearing loss, whether partial or total, they can participate on par in an inclusive setup along with their hearing peers.

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